The lost silicon process

Michael J. Sailor, professor of chemistry at University of California, San Diego, and his team have developed a way to transfer the optical properties of silicon sensors, once thought to be the exclusive domain of "nanostructured" crystalline materials, such as porous silicon, to a variety of organic polymers. Silicon downside is it is not particularily biocompatible, not flexible and can corrode," said Sailor. "You need something that possesses all three traits if you want to use it for medical applications. You also need something that's corrosion resistant if you want to use it as an environmental sensor. This is a new way of making a nanostructured material with the unique optical properties of porous silicon, combined with the reliability and durability of plastics."

The process first starts by treating a silicon wafer with an electrochemical etch to produce a porous silicon chip containing a precise array of nanometer-sized holes. This gives the chip the optical properties of a photonic crystal—a crystal with a periodic structure that can precisely control the transmission of light, much as a semiconductor controls the transmission of electrons. The scientists then cast molten or dissolved plastic into the pores of the finished porous silicon photonic chip. The silicon chip mold is dissolved away, leaving behind a flexible, biocompatible "replica" of the porous silicon chip.

Optical applications for β-Barium Borates

Shubnikov Institute of Crystallography, Moscow, and the Institute of Mineralogy and Petrography, Novosibirsk researchers are working on the crystal quality of β-Barium borate. It possesses interesting and important practical properties and is an ideal material for nonlinear optics because the â-modification doesn't have a centre of symmetry. In optoelectronics, monocrystals of â-barium borate can be used to tune the wavelength of laser radiation.

So β-barium borate provides a compact solid-state source for tuning radiation in ultraviolet, visible and infra-red ranges. For this purpose high quality crystals without any inclusions, changes of index of refraction, strictly fixed crystallographic orientation and sufficiently big (centimetric) sizes are required. Scientists P P Fedorov and A E Kokh, from Moscow and Novosibirsk, have found the optimal conditions for the production of such crystals. They grew crystals from a solution with a 1:1 ratio of barium and boron oxides with 20% sodium oxide using a modification of the Czochralski method of crystal growth. Barium borate preliminarily was synthesized by sintering barium carbonate, sodium and boron oxide at 700 °C. Half the acquired crystal was suitable for manufacture into nonlinear optical elements.

Optically nonlinear crystals βbarium borate is the best material for generating the ultraviolet radiation at a wavelength of 200nm. They also have a wide range of spectral transparency (190–3500 nm) a high threshold of laser destruction, good mechanical characteristics and are hydroscopic.

Optoelectronic transistor

Georgia Institute of Technology researchers have described a nanometre scale optoelectronic device that can perform addition and logical operations. Technology is based on arrays of electroluminescent silver nanoclusters. Devices operate at room temperature, producing an optical output from a voltage input that can be read without electrical contact. Structures perform consistently for several hours, but burn out because of heat.

"We are demonstrating optoelectronic transistor behaviour," says Professor Robert Dickson. The nanoclusters consist of silver in the forms Ag_2-Ag_8 created applying current to a slightly oxidised thin film of silver. The current induces electro migration, and creates a nanoscale break junction in the most resistive part of the film. The arrays of nanoclusters form along the break.

Future research aims at learning more about the formation process and increasing control over the cluster properties. It is hoped that the new architecture will encourage people to think about different ways to do these operations. The optical output cannot easily be passed along to other devices for further computing steps, although it is also hoped to overcome this limitation.

Process development

German organic light emitting diode displays (OLED) chemical technology developer, Covion, is claiming a breakthrough in development of electroluminescent (EL) polymers for high-efficiency full colour. In partnership with Universities in Cologne and Munich, Covion has discovered robust and efficient high resolution patterning processes for EL polymers using photolithography.

The potential is that lithographic processes, well established in volume production of colour filters for LCD monitors, can also be applied in making multi-layer OLED displays, while maintaining the OLED's performance advantages of light emission (no backlight required), brightness, efficiency and viewing angle.

SiSiC patent for FET

RF IC supplier, Sirenza Microdevices, has received a US patent for a "Microwave Field Effect Transistor Structure on Silicon Carbide" No. 6521923. This is its first patent for the "silicon on silicon carbide" (SiSiC) semiconductors. The patent is for a new structure for 1-4GHz devices that offer high power microwave performance beyond that currently available from any other semiconductor technology. Sirenza will use this new device structure with other improvements in future power amplifier module products, targeting the wireless infrastructure market.

Pablo D'Anna, director of LD MOS technology for Sirenza, says; "This technology can lead to major reductions in thermal resistance, resulting in lower junction temperatures and enhanced long term device reliability." CTO, Joe Johnson believes that SiSiC may be enable use of "standard, low-cost silicon processing, unlike more exotic competing technologies."